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Public Private Partnerships as an Inter-Organizational Initiative for the Diffusion of Broadband Technologies in Europe

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PUBLIC PRIVATE PARTNERSHIPS AS AN INTER-ORGANIZATIONAL INITIATIVE FOR THE DIFFUSION OF BROADBAND TECHNOLOGIES IN EUROPE

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Abstract

Broadband access plays a major role for the economic growth and for the social and cultural development of urban and rural areas. Market failure within the broadband sector emerges often in regions with a low density of population and weak economic conditions. A provision of broadband infrastructure and services in such areas is not attractive to private investments because of a low or even negative expected rate on return. In case of market failure, Public Private Partnerships (PPPs) can be a powerful tool to encourage the deployment of information and communication technologies, such as broadband services. A comparative case study analysis from 'broadband-PPPs' from different countries depict that the organizational and financial funding models differ from project to project.

This contribution aims to encourage the discussion about different modes of funding and organizational models of collaborations among public and private partners in the broadband sector. For this reason, organizational and financing structures of PPP projects will be analyzed by six PPP case studies from the broadband sector from Sweden, Great Britain, and France.

Keywords: Broadband Penetration, Technology Adoption, Organizational Initiatives, Digital Divide

1 INTRODUCTION

The area-wide diffusion of broadband infrastructure and services is one of the major goals of the European Commission. The European Commission states that broadband technologies are one of the main drivers for economic growth and for the generation of jobs (EU 2006). Accordingly, the initiative 'broadband for all', in the sixth framework program from the European Union (EU) converted the issue of broadband diffusion to a question of public interest.

At present, broadband technologies are not available in all EU areas. Especially, rural areas with a low density of population and weak economic structures show lacks in broadband accessibility.

A provision of broadband infrastructure and services in these areas is not attractive to private actors because of a low expected return on investments (ROI) and high economic risks. In result, market mechanisms fail. Because of the importance of the broadband technology for the economic growth in weak structured areas there exist public interest which builds the basis for the legitimation for public authorities to support the implementation of such infrastructures. This aims at reducing the digital divide and attracting the region for investors (Mühlenkamp 2004).

To solve the depicted structural problems, several European countries follow the trend to implement public private partnerships (PPPs). PPPs are special forms of co-operations among private and public partners to accomplish tasks which are of public interest (Bertelsmannstiftung et al 2003).

PPP case studies from the broadband sector, which are described and analyzed in this contribution, depict that PPP solutions may provide a win-win situation for both, private and public partners due to the sharing of economic market risks and financial resources under certain circumstances. Thus, the authors analyze different forms of organizational models and modes of financial funding of PPP projects in the broadband sector by referring to six cases from Sweden, Great Britain, and France.

In the next section a literature review will be conducted. Organizational models and funding modes of PPPs will be depicted in section 3. The research method employed is a case study. This research adopts a qualitative approach to obtain data which involves literature review, documentation analysis and interview with relevant authorities. Accordingly, this paper discusses and analyzes the critical factors that determine the success of PPP. Section 4 for will present six comparative case studies to analyze the environmental condition, organizational structures and funding policies of PPP projects in the broadband area. Four key findings will be presented and discussed in section 5. This contribution will end up with a conclusion and outlook in section 6.

2 PPP AS AN INSTRUMENT FOR RISK ALLOCATION

2.1 Trends in the Development of PPPs in Europe

There is a growing number of public initiatives to enhance broadband diffusion in particular and PPPs in general in Europe. In this context, the European Union started the 'i2010' initiative in 2005 (EU 2005). The organization 'Partnerships UK', which supports PPP projects, was founded in 2000 in Great Britain (Curwen 2000). The government in Sweden initiated the program 'IT för alla' in 2000 (Swedish Government 2006). The French government set up a special national fond for broadband projects (Premier Ministre 2006). Despite these examples, other European countries, foremost the new EU countries, but as well more developed countries such as Germany lack of (outstanding) PPP projects in the broadband sector until now, as statistics depict (DIFU 2005).

2.2 PPP - Literature Review

The emergence of PPPs in Europe is insufficiently analyzed until now in the economic and social sciences. There exists no distinctive definition or taxonomy for PPPs nor in scientific literature neither

in practice. There rather exists a wide spectrum of descriptions of different forms of co-operation among partners from the private and from the public sector, which are coupled with the term PPP (Chan 2006, Jones 2001). However, the differences between privatization and PPPs are difficult to detect, which depending on the level of government participation in it. The heterogeneous use of the term PPP is widely criticized in literature, particularly in respect to the distinction to the phenomena of 'outsourcing' and 'contracting-out' (Schuppert 2001).

For the purpose of the research focus in this contribution, the term PPP will be described by six fundamental criteria, which are often addressed in literature (Lee 2000, Eichhorn 1995, Roggencamp 1999, Budäus 2001). Hence, PPP is (1) a voluntary collaboration, based on contracts (2) among public and private partners (3) to fulfil a certain task (4) often performed in entrepreneurial manner. (5) The chances and risks are shared among the partners. (6) The partners expect a stimulation to achieve their own goals and to gain from economic synergies.

Most articles about PPPs have a national focus, thus comparative cross-country studies hardly exist (Koppenjan 2005). However, Mühlenkamp (2004) analyzed PPPs with a focus on regulatory policy and with reference to transaction cost theory and new political economics. Explicitly, Mühlenkamp (2004) states that the employment of PPPs roots in market failure, which, in the consequence, leads to a legitimation for the general authority to act in public interest. Budäus (2005) combines the discussion about PPP with the discourse about corporate social responsibility and regards PPPs as an organizational concept for social responsibility and thus encourages the argumentation from Mühlenkamp. There are some studies which compare the successfulness of PPPs with those of traditional corporations. In respect to the corporate social responsibility, social welfare always plays a major role in this context (Koppenjan 2005). Additionally, Tenbensel (2005) examines PPPs from a theoretical and institutional based perspective. He defines a PPP as hybrid forms of organization in contrast to markets und hierarchies. Hall and Soskice (2001) analyzed PPP from the perspective of comparative advantages by referring to the concept of cost-effectiveness.

However, until now there exists almost no special literature in the research field of broadband diffusion and PPPs, only one case study from Chan et al. (2006) was found. To close this research gap, this contribution encourages the discussion about different modes of funding and different models of the organization of the collaboration among public and private partners in the broadband sector.

2.3 Aims of PPPs

The reasons to set up a PPP in the broadband sector are normally motivated as follows. Under certain circumstances, the implementation and installation of broadband infrastructures by private corporations is not per se profitable. This is normally true for rural areas with low density of population and weak economic structures. Under these conditions, private actors are not covering the market with there services and products. Market failure occurs, which than requires the involvement of the public authority. The main goal of a PPPs in this context is to share the risks and expenses among private and public partners to foster the implementation of broadband infrastructure.

Private partners are integrated into such projects because of their special capabilities in management. The reasons for this efficiency are the market conditions, such as scale effects and competition pressure (Welfens 2005, Hall & Soskice 2001). In particular, the installation and administration of broadband infrastructures is difficult and need special know-how, which can often be better performed by private partners (Hall & Soskice 2001).

To sum up, the following advantages could be realized by the implementation of PPPs: (1) Load rejection of the public authorities, (2) enhancing the efficiency due to a managerial organization of the PPP (3) risk sharing/risk reduction for every single partner (4) enhancing the know-how in the project, (5) realization of synergies, (6) enhanced customer orientation and (7) faster response time (Roggencamp 1999).

3 ORGANIZATIONAL MODELS & FUNDING OF PPPs

3.1 Organizational Models of PPPs

There are several different models and classifications for PPPs in literature (Jones 2001, Weinzierl 2004, Roentgen 2001). A useful taxonomy for the purposes in this contribution is given by Brockmann (2005). She distincts among three basic organizational PPP models. These forms of organizational arrangements are applied in many different sectors, such as in the sector of education or transportation. Brockmann (2005) differentiates among:

(1) Operator Model, (2) Concession Model, (3) Cooperation Model.

An organizational model, in the broadest sense, defines the allocation of obligations in respect to service provision and risks among public and private partners in a PPP. The modes of financial funding are not predetermined on the level of the organizational model, rather on the level of the financial modes. Thus, the main features to distinct among the models are the contractual obligations and the risks (Baker 1986).

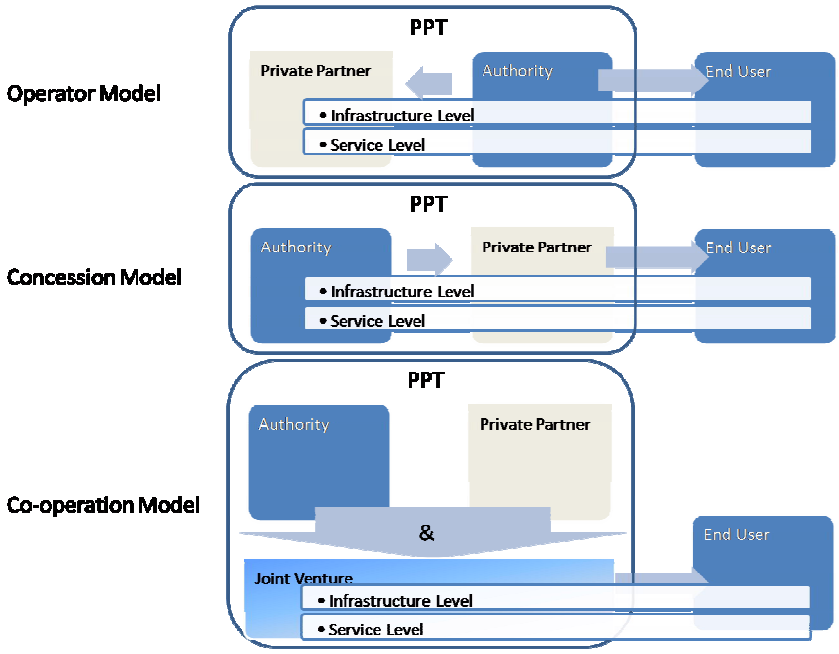

Figure 1. Organisational Models of PPP in the Broadband Sector

(1) In the *operator model,* the public partner, considered as a group of different actors or simply one single actor, holds the contractual obligations. The private partners are in charge to provide all - or at least parts - of the services or of the infrastructure. The citizens discharge tolls to the public authority. In turn, the public authority pays for the services from the private partners. The public partner bears the warranties for the provision of infrastructure or services. The private partners take over the risks of the provision of the infrastructure and of the services exclusively.

(2) In the *concession model*, the public authority grants concessions to the private partner(s). The private partner is responsible for the customer relationship and thus holds the direct contact to the citizens. The concession includes the right to take tolls directly from customers.

(3) The *co-operation model* comprises the foundation of a corporation under private law. Both, public and private partners can be shareholder of this corporation. The operational risk is shared between the public and the private partner(s) in the co-operation model.

However, PPP projects in the broadband sector demand for an extension of Brockmann's classification. Due to the specific characteristics of telecommunication networks and services, the models have to be adapted for this sector. Because broadband services consist of at least two services on different levels, which is the provision of the technical infrastructure and the provision of broadband services, the involved parties have to be separated in operational models, too. To assure the success of a broadband PPP, competition among service provider should be established (Welfens 2005) (Figure 1). Hence, different organizational and financial modes and different PPP constructs on the technical and service level can be found in a single broadband project.

However, as this contribution depicts differences in organizational and financial modes in general, the differentiation among the three mentioned models by Brockmann is sufficient for the research subject in this contribution. Nevertheless, for reasons of completeness, the two levels, service and technology, are differentiated in figure 1, too.

3.2 Modes of Financial Funding in PPPs

Theoretically, the modes of financial funding of PPP projects cover a wide spectrum. This spectrum encompasses modes of a 100% funding by the private partners up to a 100 % funding by the public partners. Between these two extreme positions, there exists a continuum of combinations of sharing the financial funding. For reasons of simplification, the 'range of shared funding' will be defined in this contribution as the continuum between the 25%- and the 75%-quantil. Consequently, in this terminology there are three basic financial modes to distinct: a 100 % funding by the private partner, a 100 % funding by the public partner and a range of 'shared funding' (Figure 2).

In general, nor the private neither the public partners comprise of only one company, respectively authority. There are normally several different public partners involved in a PPP, such as the European Union, states, countries or the local authorities etc. For the purpose of this survey it is not useful to make an additional distinction in the group of the private partners and in the group of public partners. Most important for analyzing the impact of the financial sharing among private and public partners in a PPP is the relationship between these two involved groups, not the relation between the partners in their group, respectively between partners in the group of public actors.

Figure 2. The Spectrum of Financial Funding in a PPP

The modes of financial funding and risk allocation suppose to be, next to the organizational model, one of the major success factors for a PPP project. However, these two factors are related somehow. Moreover, the underlying risk is of fundamental relevance for the specification of the modes of financial funding.

To detect the interrelation between financial funding, environmental conditions and organizational models of PPPs in the broadband sector, the following four hypotheses will be validated by analyzing case studies from PPPs in the broadband sector from Sweden, Great Britain, and France.

4 CASE STUDIES

4.1 Methodology of the Case Study

The research method employed is a case study. This research adopts a qualitative approach to obtain data which involves literature review, documentation analysis and interview with relevant

authorities (triangulation approach (Miles & Huberman1994). Accordingly, this paper discusses and analyzes the organizational, financial, risk and environmental structures of PPP in the broadband area. This research method follows the approach of Langley and Royer who view 'a case as a bounded system [which] simply requires a researcher to focus on the details of a case and to analyze its context - it does not a priori restrict the methods used to achieve this.' (Langley & Royer 2006, p. 74). Additionally '…tying the emergent theory to existing literature enhances the internal validity, generalizability, and theoretical level of theory building from case study research.

While it is important to link empirical research results to theoretical considerations, this is of even more importance in theory building because the findings often rest on a very limited number of cases (Eisenhardt 1989, p. 545). Because 'case studies typically combine data collection methods such as archives, interviews, questionnaires, and observations' (Eisenhardt 1989, p. 534; Yin 2004), in-depth expert interviews were performed as well as several other sources such as available information on the firm's web-homepage and articles published in magazines, journals and newspapers have been taken into consideration. The case studies based on guided interviews with experts and managers from broadband PPPs. The exploration was complemented by data from publicly available sources. The survey was conducted between February, 1st 2006 and April, 30th 2006. Other information were gathered from available documents and reports of and about the PPPs.

The presented results in this contribution are part of an analysis which comprises in total twelve PPP broadband cases from Sweden, Great Britain, France, and the Netherlands. Six of these case studies are provide sufficient data to conduct a research on the mentioned objective.

4.2 Case Study Objects

4.2.1 Case Study: 'Falkenberg'

The Swedish municipality 'Falkenberg', located near to Gothenburg, lacked in the provision of broadband infrastructure until the year 2000. In 2000, the municipality decided to found a PPP together with e.On Broadband as the private partner in the PPP, a subsidiary of the German e.On corporation, to build up a cable infrastructure and broadband services. Initially, the PPP based on a concession model, where e.On broadband was the only concessionaire with the allowance to provide services on the established technical infrastructure. After a successful start of the PPP, Telia Sonera, the former state-owned telecommunication provider in Sweden, entered the market with an own technical infrastructure and rewarded the same concession from the municipality like e.On, in order to ensure competitive neutrality. This is quite remarkable, because Telia Sonera has had no interests in establishing a broadband infrastructure in this region before the implementation of the PPP.

4.2.2 Case Study: 'Connected Communities'

The Western Isles are located off the northwest coast of Scotland. They consist of more than 55 islands (Comhairle 2005). The region is characterized by a declining and ageing population. There has been a sustained attempt to modernize the economy since 1990. Parts of the region are already covered by a broadband infrastructure of the British Telecom (BT). The project 'Connected Communities' focuses on areas where no broadband infrastructure exists at all, and was realized as a cooperation model. They started in 2004 to establish a wireless satellite based broadband infrastructure (6 Mbit/s). A new company, Hebrides.net, was founded by the PPP to provide broadband services. The infrastructure is 100% publicly financed by Scottish Executive and local communities.

4.2.3 Case Study: Pathfinder North (Highland Council)

The Highland Council is one of the largest council by territory in the UK. The large area and relatively small population result in a low population density of 8 persons per square kilometre (Highland Council 2005). The project 'Pathfinder North', supported mainly by the Scottish Executive, aims to enhance the demand for broadband services by the broad public, by involving more than 450 schools,

libraries, and the public administration in the project (Pathfinder 2006). Thus, as an innovative component, pull strategies were implemented. The geography of the Highlands and Islands requires an innovative approach to the provision of broadband services, using a range of technologies to ensure that all schools and authority sites have equal access to the services. The technologies been used are Fibre optic cables and Radio technology (5.8 Ghz Wireless) to connect over half of the Pathfinder North sites. Also existing infrastructure from the British Telecom is in use.

The PPP 'Pathfinder North' is organized as an operating model. Funding and project management is solely provided by the public partners. Private partners are involved in planning, installation, and implementation, as well as in the maintenance of the physical infrastructure (Pathfinder 2006). The tendering process of the project is still ongoing (status: mid 2006).

4.2.4 Case Study: 'Irisé'

The Irisé project aims to build up an open broadband infrastructure on the basis of various technologies for different operators and service providers to break the monopoly of France Telecom in the area of 'Ile de France' The project was initiated by SIPPEREC in 2001, an inter-communes organization of 86 cities in the region 'Ile de France'.

A new company, Irisé, was founded by the involved partners to fund and administer the network. The PPP is established as a co-operation model. Involved partners are the LDCollectivités, a 100% subsidiary of Neuf Télécom, the Caisse des Dépôts et Consignations, a public financial institution, Telcité as an subsidiary of a public corporation, and Dexia as a private partner who is specialized on project management. Irisé is successful in providing broadband access in the region. Low prices and innovative services enhance the diffusion of broadband in the areas.

4.2.5 Case Study: 'Teloise'

The French region Oise is characterized by smaller cities and rural areas. The project Teloise was first considered in October 2000. The project aims to achieve two goals: (1) uncovered areas should be supplied with broadband technologies and services (no specific technology), (2) competition should be increased. The private partners for the PPP were selected in February 2004 by the municipality Oise. The PPP is realized in the form of a concession model. The installation and implementation started in July 2004. The first cities (Beauvais and Compiègne) connected to the network in January 2005. At the beginning of 2006 the infrastructure was not totally deployed. However, network effects started to be effective. One of the major milestones for the success of the project was the involvement of Free, Neuf-Telecom, and Cegetel.

4.2.6 Case Study: 'Pau Broadband Country'

Pau Broadband Country (PBC) is an innovative project with the aim to launch the first very-high-speed infrastructure (10mbps to 100mbps) in France. The technological infrastructure was build up solely by the group of communes in the 'Pau Pyrénées' region (14 cities from the department Pyrénées-Atlantiques). This PPP is organized as an operation model. The public authority provided 100% of the funds and therefore is the owner of the net. The municipality 'Agglomération Pau Pyrenäen' manages the project and provides funds and the implementation of infrastructure. The private partners are responsible for the marketing and service provision.

5 FINDINGS

Four major findings could be extracted out of the cases:

- *Finding 1*: Each PPP project is co-funded by the public authority.

- *Finding 2a:* 'Concession models' are regularly set up when partners agree to share the funding of PPP projects; *Finding 2b:* 'Operator models' are regularly employed in the case of a 100% public funding; *Finding 2c:* 'Co-operation models' are applicable for both modes of funding;
- *Finding 3:* The operator models are applied in projects with high economic risks. Concession models are established within low risk projects.
- *Finding 4:* Concessions for the private partner(s) are usually assigned over a time period, which corresponds with the period of amortization of the private investment.

Finding 1- Each PPP project is co-funded by the public authority

There exists no 100% private funding of PPP projects in the broadband sector. None of the twelve, respectively six, projects from the whole survey were funded solely by private investors. The French 'Irisé' project has the highest financial involvement by the private partners with a share of 56%. The French project 'Teloise' is equally funded by public and private partners. The national and local government is engaged with 50% as well as the private partners. The Swedish PPP project 'Falkenberg' is financed by the Sydcraft, a big Swedish power supplier, by 55%. The projects 'Connected Communities', 'Pathfinder North', and 'Pau Broadband Country' are characterized by a 100% financial investment by public authorities (see Figure 3).

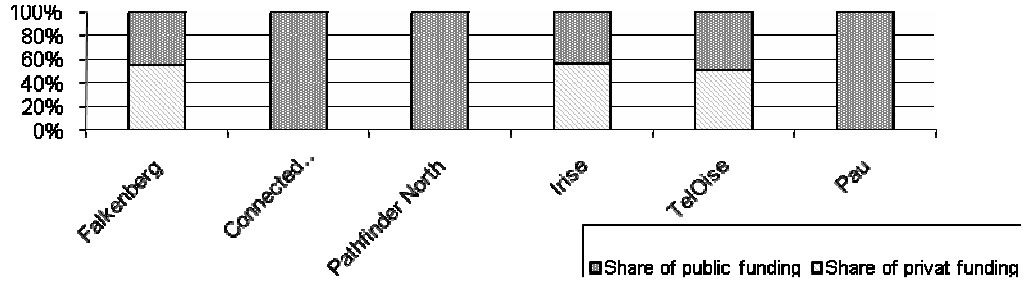

Figure 3. Share of funding between public and private partners in the surveyed PPP

This could be reasoned by the following argumentations. PPPs are legitimated only in case of market failure. A market failure is characterized by the following two aspects: (Characteristic 1) Private market participants are not willing or are not able to provide services. (Characteristic 2) The services or products are of public interest. As the broadband diffusion is defined as a field of public interest (EU 2005), there is a legitimation to establish PPPs in this sector in principal. However, if private partners are willing to take 100% of the market risks (characteristic 1), there exists no market failure. The implementation of PPPs will than probably lead to inferior solutions.

Finding 2a/b/c: 'Concession models' are regularly set up when partners agree to share the funding of PPP projects; 'Operator models' are regularly employed in the case of a 100% public funding; 'Co-operation models' are applicable for both modes of funding.

The Swedish project 'Falkenberg' and the French project 'Teloise" are organized as a concession model. Both cases have balanced funding between the public and private partners. The projects 'Pathfinder North' and 'Pau Broadband Country' are organized according to the operator model. Both projects are publicly funded by 100 %. The cooperation model applied in the project 'Irisé' (56 % private and 44 % public funding) and 'Connected Communities' (100 % public funding). Thus, the case studies verified the second hypothesis.

Reasoning: *Concession models* are set up to guarantee a positive, or at least no negative ROI for the private partners. In the case of a 100% public funding, there is no reason to guarantee a certain level of ROI, because there is no investment by private partners. Thus there is no need for a concession model.

Operator models are generally set up at the aim to establish a competitive environment among involved service providers in the broadband sector. Thus, the expected profits for every single private

partner diminish and the risk to receive adequate rates of return rises. As a consequence, the private partners are hardly willing to take part in the financial funding, especially in environments which are coined by high risks, which is normally the case in rural areas with weak economic conditions. Thus, this form of organizational model is principally applicable in case of a 100% public funding.

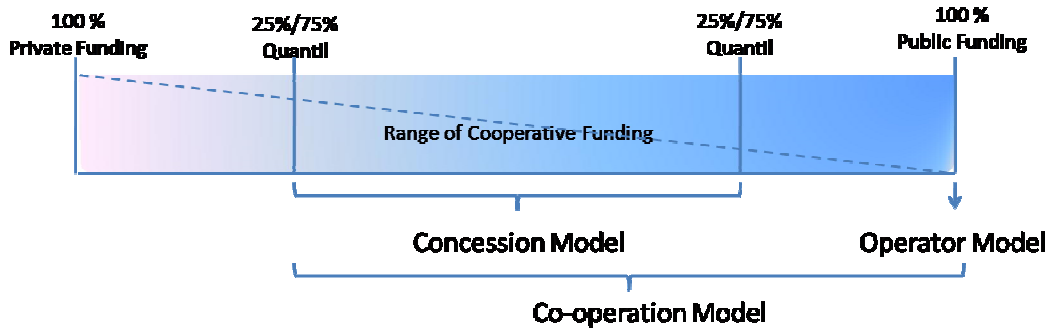

Figure 4 Funding Modes and Organizational Models

Co-operation models are highly flexible, because the contracts are negotiated by the partners and are directly dedicated to the specific environmental circumstances. Thus, the co-operation model is applicable for all types of financial funding.

Finding 3: The operator models are applied in projects with high economic risks. Concession models are established within low risk projects.

The *concession model* is applied in the project 'Teloise'. The region Oise extents to 5860 square kilometres with 133 inhabitants per skm (INSEE 2006). The population density is very heterogeneous in the Oise region. There are some bigger cities but as well very rural areas. Respectively, the risks of operating a broadband infrastructure in this area can be determined only be viewing on the specific sub region in Oise. However, risks can be reduced in such regions by combining rural with urban areas to equilibrate the risks, but as well the ROIs.

Just as in 'Teloise', the municipality of 'Falkenberg' applies a *concession model* for their broadband project. The population density in the municipality 'Falkenberg' amounts approximately 36 inhabitants per skm. Despite the relatively small density of population, the risk in this region is limited because Falkenberg lies next to the urban region of Gothenburg. This promises a rather high acceptance rate by the citizens. Additionally, the net infrastructure can easily be connected to existing broadband infrastructures (eOn 2006).

The *operator model* is rather deployed in projects, which are connected with a high economic risk for the involved partners. The Highland Council is characterized by a very low population density of about 8 inhabitants per skm. The project 'Pathfinder North' thus contains high risks. The project is organized as an operator model.

The region 'Pau Pyrénees' is coined by a quite high density of population in comparison to the other analyzed PPPs with 150 inhabitants per skm. This is an indication for a moderate risk in the context of the implementation of a broadband infrastructure. However, the implemented FTTH (fibre to the home) infrastructure - first very-high-speed (10mbps to 100mbps) infrastructure in France - contains high costs and thus is bundled with higher risks than the implementation of other broadband solutions. Thus the operator model is more applicable under these circumstances than a concession model. As the other PPP projects, 'Connected Community' and 'Irisé', base on cooperative models, these cases convey no added information regarding the mentioned finding.

Reasoning: Operator models enable the individual negotiation of the revenues for the private service providers under consideration of the underlying risks. Thus, this model enables to reduce the risks for the private partners down towards an acceptable level. Contrariwise, concession could not guarantee a positive rate on return in all cases, even not over an unlimited period of time. This is especially true

for projects with high risks. As there is a direct correlation between economical risk and population density, the economical risks for PPP projects could be operationalized in this contribution by the combined analysis of the density of population per square kilometre (DPKM2) with the risk categories 'high risk' (DPKM2<10), 'moderate risk'(DPKM2 >10<100), and 'low risk'(DPKM2>100).

The analyses show that the density of population is negatively correlated with economical risk. This can be derived from the following two arguments: (1) With a higher population there is a higher number of potential customers. More customers promise per se a higher ROI. (2) As the number of broadband users rise with the number of potential users in an area, the chances to gain from net effects within a local region rise too (König & Weitzel 2003, Thomas 2002).

Finding 4: Concessions for the private partner(s) are usually assigned over a time period, which corresponds with the period of amortization of the private investment.

The maturity of PPP arrangements depends mainly on the payback period and on the degree of involvement by private partners. The French projects depict, that the duration of the projects are correlated with the duration of the payback period.

The private partner in the Teloise project awarded the concession for 22 years. The private partner invested around € 25 Mio under moderate risks (138 inhabitants per skm). The Irisé project bases on similar arrangements even if there are no concessions. Irisé, as the constituted corporation which manage and administer the infrastructure, is claim holder of the network for 18 years until 2019 which corresponds with the payback period of such infrastructure projects. The private partners invested around € 28 Mio under low risk conditions (>900 inhabitants per skm in average). The concession in the 'Falkenberg' case contains a period of 12 years. The private investments were quite low (55% of € 3.2 Mio) but included a quite high risk because of the low population density (36 inhabitants per skm).

As the British PPPs and the Pau project were publicly financed by 100%, these examples have not been considered in this context.

Reasoning: Private corporations invest in high risky projects only if the investments promise positive ROI over a limited period of time. The expected returns must match with the underlying risk. Concessions reduce the risks for the investment by guaranteeing a local monopoly. The period for the awarded concession must at least be as long as the planned period to reach the breakeven point for the private investment. As the risk of reaching the breakeven point is very high in regions for example with less than 10 people per square kilometre, the concession has to be contracted for a long time.

While using an explorative comparative case study approach, there are several related risks according to this research method. The analyses of cases in an explorative way are appropriate research techniques to detect basic structures, such as relations between financial and organizational structures of PPPs. However, to receive deeper insights of these relationships, a more comprehensive research method should be applied (Eisenhardt 1989, p. 547). Furthermore, it has to be concluded with cautionary remarks that this study – even if this is a comparative analysis - suffers from the issue of generalizability due to the explorative character. This research relies on single case studies drawn from very specific cases with different preconditions and different broadband technologies employed. Hence, the generalizability of the presented findings should be considered cautiously.

PPP Project	Population Density (Inhab./skm)	Financial Structure	Organi-zational Model	Maturity of concessions/ contract	Risk	Technology
Falkenberg (S)	36	45% public 55% private (3.2 Mio €)	concession model	12 Years	Moderate – High	cable
Connected Communities (GB)	9	100% public	cooperation model		High	wireless satellite BB infrastruct. (6Mbit/s)
Pathfinder North (GB)	8	100% public	operator model		High	Fibre optic cables & Radio

Irisé (F)	940	44% public 56% private (50 Mio. €)	cooperation model	19 Years	Low	(5.8Ghz) Diverse > 256 bit/sec
Teloise (F)	133	50% /50% (50 Mio. €)	concession model	22 Years	Moderate - Low	Diverse > 256 bit/sec
Pau Broadband Country (F)	150	100% public	operator model		High (new tech.)	very-high-speed infrastr. (10 to 100mbps)

Table 2. Overview of PPP Project

6 SUMMARY AND OUTLOOK

At present, broadband access is not guaranteed in all regions of the EU. Especially this is observed in areas with unattractive economic conditions for broadband projects. This is for example the case in areas with a low and over aged population. In these cases, market failure prevails. However, technical connectivity and the access to broadband services are of public interest, in order to support economic growth and to avoid digital divide. This leads to a new field of activity for the general authority.

This contribution showed, by the analysis of six case studies that there are relationships among three key factors of PPPs: environmental conditions (risk, social structures, density of population etc.), organizational model, and funding modes. The following statements are derived from the explored case studies: (1) Broadband PPP projects are founded only in the case of market failure. (2) There exists no 100% private funding of PPP projects in the broadband sector. (3) Three models of organizational structures can be distinct among PPPs in the broadband sector: concession model, operator model, cooperation model. (4) Concession models are regularly set up when partners agree to share the funding of the PPP project. (5) Operator models are regularly used in the case of a 100% public funding. (6) Cooperation models are applicable for a shared and a 100% public funding. (7) The operator model will be applied in projects with high economic risks. Concession models are established within low risk projects. (8) Concessions for the private partner are usually assigned over a time period, which corresponds with the period of amortization of the private investment.

PPPs represent a good alternative to build a broadband infrastructure by means of partnership collaboration between public and private partners. The examined cases verify that PPPs are appropriate instrument to implement broadband infrastructures, especially in conditions of market failure.

Still there exist several EU Countries who are not applying these instruments for the implementation of new and innovative information and communication infrastructures, even if there are rural areas with a tendency to market failure. Further research will focus on the applicableness of best practice examples for different countries and environmental conditions.

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